

Appl. No. 10/681,497  
Response of OA of 4/9/2008

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### **Remarks/Arguments**

The Applicant requests the claims following amendment be accepted. This includes New Claim 17, which is drawn narrowly to include a limited number of elements, as well as Claims 1, 3-6, 8-12, and 14-16. Each OA objection to these claims is addressed.

#### **Arguments regarding OA 2: Claims 1, 3-5, 10, and 16**

1. Chow's boric acid limits are 0.02% - 20% (2:38-45) of the lignocellulosic material which is 10 - 60% of the weight of the total composite. This gives a range of 0.002 - 12% of the total composite range which is greater than the 2-12% of the present invention's claim 1.  
  
Further, Chow' preferred limits, 0.9 - 1.5% of the lignocellulosic material translates to 0.09 - 0.9% of the total composite. This is well outside the 3 - 5% range of Claim 3.
2. The color darkening and odor, which transpire if the composite is produced at 200 °C and above, are the result of the lignocellulosic degradation created at these temperatures (1:25-41). These results occur immediately following production whereas the color darkening noted in the present invention is the result of mold formation and occurs only after months of exposure to the elements. As a result, one following Chow's method would be experimenting and optimizing on the wrong result and would not achieve the results and benefits of the current invention.

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Chow's Examples illustrate how this would occur. Example I (5:10-42) contrasts a sample with no boric acid with one containing only 0.8% at processing temperatures of 200 °C or less. Although there was no discoloration of the lignocellulosic material of either sample, the odor of the 0.8% loaded sample was less. Therefore one following Chow's teaching would arrive at the conclusion that 0.8% boric acid, at most, is an effective loading. Per the present invention a minimum of 2% is required for mold reduction.

Example IV (6:37-7-30) contrasts boric acid samples from 1% to 20% at processing temperatures of 220 and 250 °C. Table I and the commentary illustrate the inability to correlate the boric acid content with color change caused by temperature degradation. Increased content was found to decrease color darkening at all press times at the 250 °C level **but** at the 220°C level just the opposite occurred. Further, per Table I, boric acid concentration of 1% gave a similar color result as the 20% sample. Chow presents an uncorrelated dose-response condition, whereas the present invention identifies a positive dose-response correlation.

3. Claim 16 has been amended to eliminate boric acid.

**Arguments Regarding OA 4: Claims 1, 3-6, 8-12, and 14  
and  
OA 9: Rational to reject Unexpected Results**

1. OA 4 at p4 : "Aida lacks sufficient specificity to anticipate the claimed range" and therefore the rejection relies on obviousness".

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Applicant submits arguments presented in the 3-20-2008 response regarding unexpected results and the additional arguments presented on this page transverse the obviousness rejection.

2. OA 4 at p5: "As to Claim 10, Lloyd teaches that Borates such as boric acid ...(1:32-36)".

Applicant notes that Lloyd then states that boric acid is soluble in water which, when used in composites, results in poor mechanical strength (1:37-42).

3. OA 9 at p 10, 11

Items a & b. The Borogard ZB reference is July 26, 1993—Applicant states this for the record and confirms it in IDS 5.

The Borogard ZB label is instrumental in demonstrating why the use of zinc borate in WPC's to reduce mold was a surprising result. Although the label states that zinc borate could be used to control mold fungi such as *Aspergillius Niger* at 3-30phr, the chemical proved to be ineffective at that task as shown in the prior art of Marks and Ross.

Marks (USPN 6,416,789 at 1:24-35) states "zinc borate ...does not provide good protection against mold, mildew and staining fungi at typical use levels. Ross makes a similar statement. The only typical use levels were contained in the EPA Registered Borogard ZB label, which was the only legally registered zinc borate that could have been used as a fungicide at that time. It can not be ignored that two different people skilled in the art found this product ineffective in plastics.

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The Borogard ZB label does not claim mold fungi effectiveness in wood composites. The fungi listed in the label, *Trametes versicolor* and *Gleophyllum trabeum*, are decay (rot) fungi.

Given that zinc borate was ineffective in plastics and not even claimed to be effective in wood (which because it is a food for mold fungi is more susceptible to mold than plastic), it is surprising that (1) the chemical was found to work at all in wood plastics and (2) that it works only after adding at least 2%.

Item c. Other than the present invention, Laks was the first to recognize the effectiveness of zinc borate as an effective mold suppression chemical in WPC's. When the leaders in the field took years to discover the facts revealed by the present invention, it is a clear indication of unexpected results.

Item d. Koskiniemi validates the Applicants assertion that colemanite does not effectively suppress mold growth. Touval only shows that colemanite, if combined with stannic oxide, can work as a fire retardant in PVC. And even then it takes an 8% colemanite loading to be effective (Table 3, page 9).

Item e. No further comments other than the March 20<sup>th</sup> submission

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**Arguments Regarding OA 5: Claims 1, 3-5, 6, 8, 9, 11, and 15**

1. Touval teaches that non-halogenated polyethylene requires a range of 4- 25 % of flame retardants. He then demonstrates in Example 3 (8:66 – 9:4) that colemanite is even less effective than the lower portion of this range. Even when the polyethylene is augmented with a halogen( 8% chlorinated paraffin) and 2% stannic oxide is added, at least 8% colemanite is required (Table 2). Eight percent is well out of the range of the current invention's Claim 3 and in the high portion of Claim 1.
3. Pelikan uses a lignocellulosic material as a carrier for a gas foaming medium of either water or an aqueous dispersion. Pelikan teaches a range of 3.5 - 23% lignocellulosic material as he requires the carrier plus medium to be 5 – 25% of the plastic and the medium to be 8 to 30% of the carrier (6:40-52). As a result the plastic is > 75% of the composite, while the plastic range in the current invention is 25 – 75%.
3. Pelikan teaches a lignocellulosic minimum particle size of 350 microns in diameter and 1-8 mm in length (6:39-42). Clemons (UDSA) in *Wood Plastic Composites in the US* identifies the typical wood particle size as 10 to 80 microns. Verhey in *Wood Particle Size Affects the Decay Resistance of Woodfiber-Thermoplastic Composites*, identifies that a wood plastic composite becomes more vulnerable to decay as particle size increases. Verhay's worst case is a 20 mesh particle which is only .84 mm.

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Pelikan's primary function for a lignocellulosic material is as a carrier for a foaming agent. Since he teaches a relatively small (<25%) lignocellulosic content, a 1-8mm particle size may be acceptable. But for the composites described in the current invention, where the lignocellulosic content can exceed 60%, such large particles are unacceptable as they would introduce an undesirable vulnerability to decay.

4. **MPEP 2143.01 (IV):** The proposed modification can not render the prior art unsatisfactory for its intended purpose. The addition of lignocellulosic material would provide an unacceptable component to Touval's invention of a flame retardant composite containing Stannic Oxide. Holmes (USDA/Forest Products Laboratory) in *Effect of Fire-Retardant Treatments on Performance Properties of Wood* identifies that Stannic Oxide stimulates glowing of burning wood. Glowing is the visual evidence of combustion of the carbon in the char layer of the burning wood. Wood that has been effectively treated should not exhibit any after-glow.

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**Arguments Regarding OA 6: Claims 1, 3-6, 8-12, 15, and 16**

1. **MPEP 2143.01 (III):** The fact that references can be combined may not be sufficient to establish obviousness. There is no suggestion of wood preservation or the use of borates in Pelikan. Lloyd's teaching of calcium borate and colemanite as wood preservatives does not teach that they would be effective in a wood-plastic combination where plastics can be as much as 75% of the total. Indeed Koskiniemi teaches colemanite is not effective and synthetic calcium borate must be modified to be effective in plastics. In summary there is no motivation to combine these references.
2. **MPEP 2143.01 (IV):** The proposed modification can not render the prior art unsatisfactory for its intended purpose. The OA suggests that Pelikan suggests flame retardants. However colemanite is not an effective flame retardant at levels of the current invention and even in Touval, where it is combined with Stannic Oxide, required an 8% loading.
3. Applicant's OA 4 arguments regarding unexpected results and OA 5 arguments regarding Pelikan also apply to OA6.

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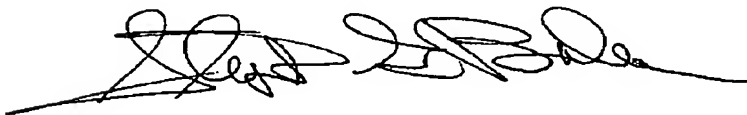
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**Arguments Regarding OA 7: Claims 1, 3-6, 8-12, 15, and 16**

1. Claims 8-12 involve calcium borate and therefore should not be included in this rejection.
2. Applicants OA 4 arguments regarding unexpected results and OA 5 arguments regarding Pelikan also apply to OA 7.

**Summary**

For all reasons given above, as well as those presented in the 3/20/08 Amendment, Applicant respectfully submits the distinctions are of patentable merit under Section 103. Accordingly Applicant submits this application is now in full condition for allowance. Respectfully Submitted,



Stephen G. Bales  
17 Hart Lane  
Sewell, NJ 08080